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5 Claims

1. Method for preparing a membrane to be assembled in a membrane electrode assembly, comprising the step of swelling an ion-conducting membrane in a liquid
10 containing at least one solvent or to an atmosphere containing the vapor phase of at least one solvent by controlling the content of the solvent in the ion conducting membrane.
- 15 2. Method according to claim 1, characterized in that the ion conducting membrane is a radiation grafted membrane.
- 20 3. Method according to claim 2, characterized in that the graft level is in the range of 5 to 50 mol%, preferably 10 to 40 mol%.
- 25 4. Method according to claim 2 or 3, characterized in that the grafting solution comprises a crosslinker monomer; the content of said crosslinker monomer is in the range of 5 to 25 %, preferably less than 20%, relative to
30 styrene.
5. Method according to claim 1 or 2, characterized in that prior to the swelling step,
35 a) the ion conducting membrane is treated in a strong acid solution for a period in the range of 10 minutes to 120 minutes; and

b) rinsing the so-treated ion conducting membrane,
preferably until the rinse water is neutral.

5. Method according to any of the preceding claims,
5 characterized in that
the ion conducting membrane is coated, preferably
impregnated, with a ionically conducting polymeric phase.

6. Method for manufacturing a membrane electrode
10 assembly using a ion conducting membrane, i.e. a ion
conducting membrane prepared according to any of the
preceding claims, comprising the steps of:
a) providing a ion conducting membrane in a pre-swollen
state;
15 b) coating of the ion conducting membrane on both sides
with an electrode layer to form a sandwich; and
c) hot-pressing the sandwich to form an ion conducting
bonding of the afore-mentioned layers of the
sandwich.

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7. Method according to claim 6,
characterized in that
a catalytic active layer is disposed between the
electrode layer and the ion conducting membrane on both
25 sides of the ion conducting membrane.

8. Method according to claim 6 or 7,
characterized in that
as electrode layer one of the group consisting of a
30 carbon cloth, carbon paper and a carbon felt is used,
preferably applied in form of a hydrophilic liquid, such
as a polar and hydrogen-bonding solvent.

9. Method according to any of the preceding claims 6 to
35 8, characterized in that
the hot-pressing condition are selected from at least one
of the following conditions:

- a) temperature in the range of 70 to 150°C, preferably in the range of 90 to 120°C;
- b) pressure in the range of 2 to 30 MPa, preferably 5 to 18 MPa; and
- 5 c) duration time of hot-pressing treatment in the range of 15 to 400 seconds, preferably 60 to 240 seconds.

10. Method according to any of the preceding claims 6 to 9, characterized in that

- 10 the catalytic active layer comprises at least one selected from the group containing platinum, ruthenium, rhodium, rhenium, nickel, rare earth and transition metals and compounds thereof.
- 15 11. A membrane electrode assembly, i.e. manufactured according to any one of the preceding claims 6 to 10, comprising a hot pressed sandwich comprising an electrode layer, a ion conducting membrane and again an electrode layer, thereby using the ion conducting membrane in its
20 pre-swollen status prior to the hot-pressing.
- 12. A membrane electrode assembly according to claim 11, characterized in that
the depth of the ion conducting membrane is in the range
25 of 5 to 250 μm , preferably 20 to 200 μm .